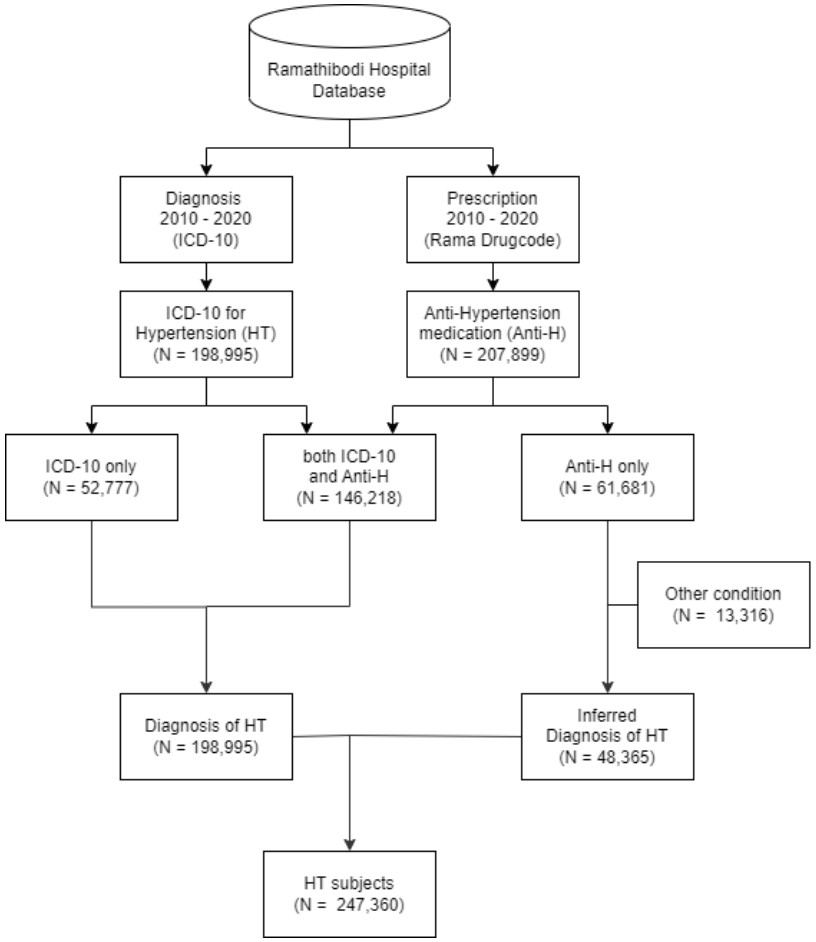
Mahidol University
Faculty of Medicine Ramathibodi Hospital

Hypertension Data Warehouse

Htun Teza

Data Science and Clinical Informatics

11 Years cohort



ICD-10 codes used for Diagnosis of Hypertension (HT)

I10 Essential (primary) hypertension
I11 Hypertensive heart disease
I12 Hypertensive chronic kidney disease
I13 Hypertensive heart and chronic kidney disease
I15 Secondary hypertension

Antihypertensive Medications (Anti-H) used for Diagnosis of HT

At least one drug group prescribed
Angiontensin-converting Enzyme Inhibitor,
Angiotensin II Receptor Blocker,
Calcium Channel Blocker,
Alpha Agonist,
Alpha Blocker,
Alpha Beta Blocker,
Beta Blocker,
Diuretic,
Ergot Alkaloid,
Hydralazine,
Minoxidil,
Neprilysin Inhibitor,
Renin Inhibitor,
Reserpine,
Statin

Other conditions commonly prescribed with Anti-H

Angiontensin-converting Enzyme Inhibitor: Heart Failure
Angiotensin II Receptor Blocker: Heart Failure
Calcium Channel Blocker: Arrhythmia (non-Dihydropyridine)
Alpha Agonist: Hypertension in Pregnancy
Alpha Blocker: Benign Prostatic Hyperplasia
Beta Blocker: Hyperthyroidism
Neprilysin Inhibitor: Heart Failure

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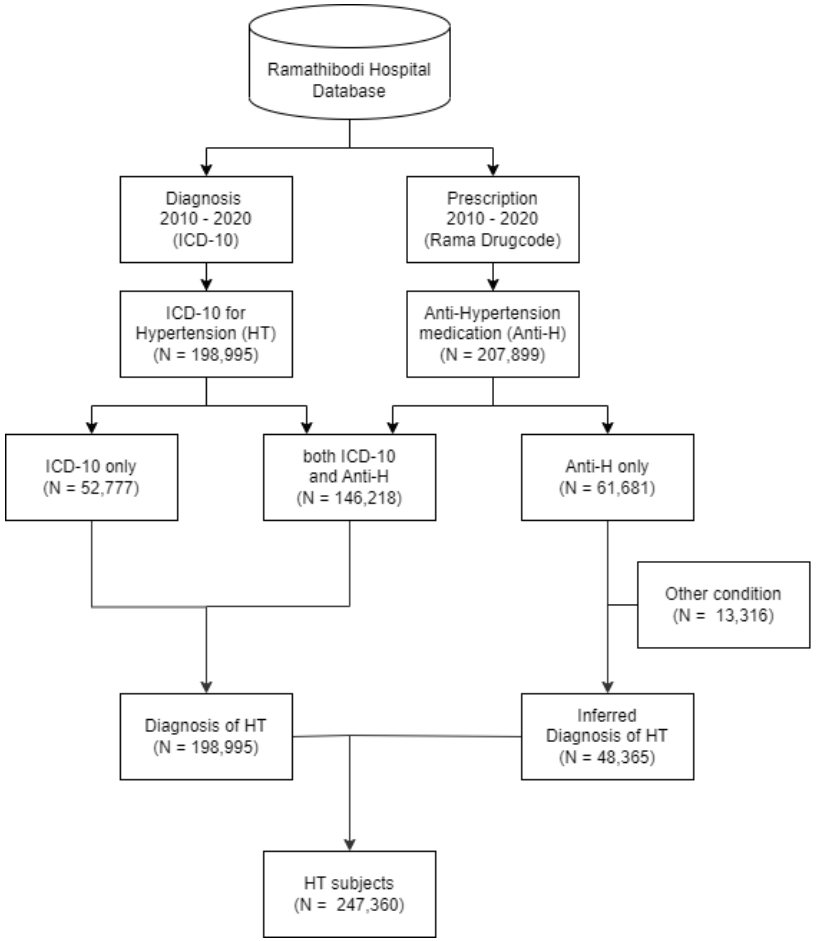
Cohort update



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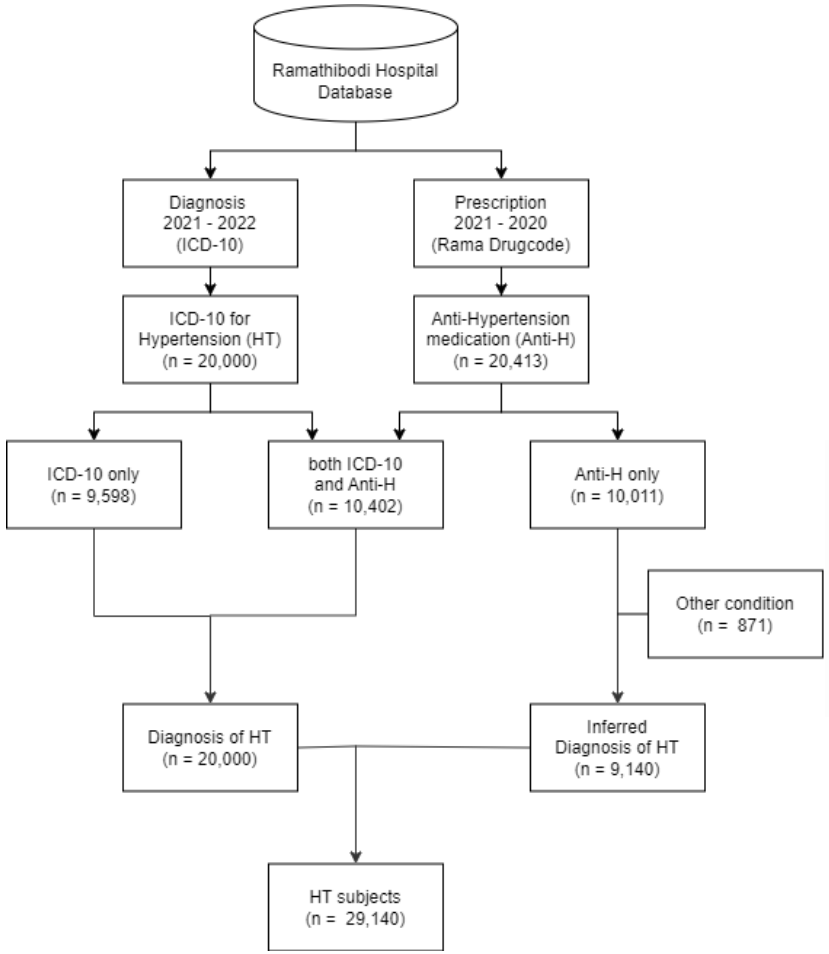
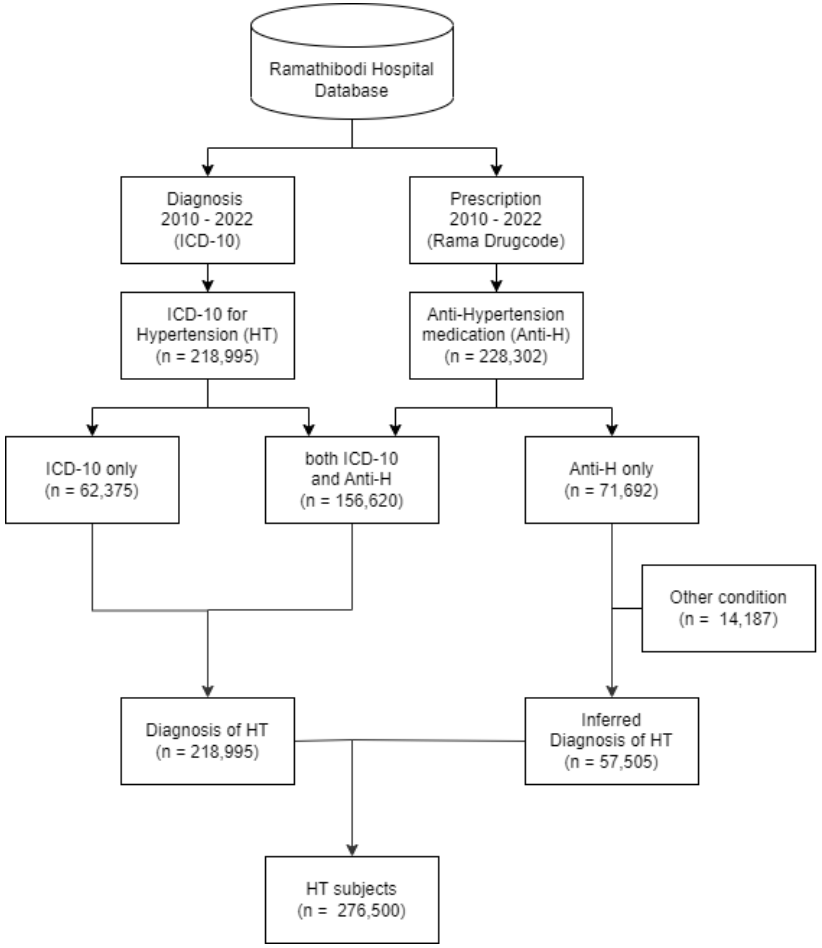


13 Years cohort



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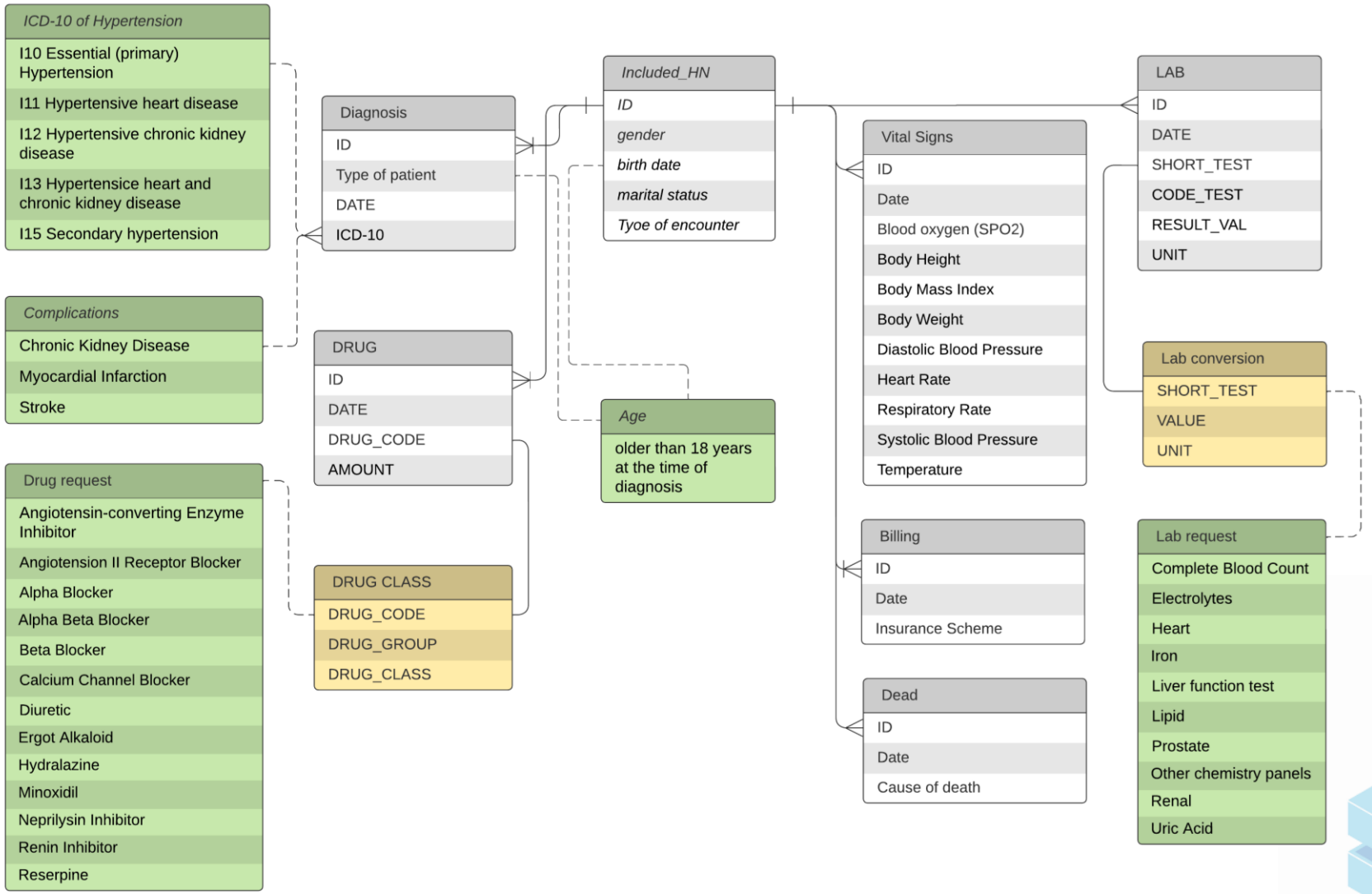

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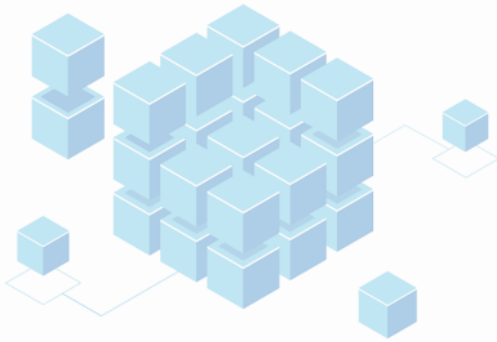
White box : Table from Rama database
Yellow bos : External table
Green box : Requested data

Projects

	Title	
Disease Progression of Hypertension		
1	Evaluation of transitions from early hypertension to hypertensive chronic kidney disease, coronary artery disease, stroke and mortality: A Thai real-world data cohort	Htun Teza
2	*Factors influencing disease progression of hypertension: A multi-state model (Tentative title)*	Htun Teza
3	*Treatment-effectiveness of anti-hypertensive drugs on disease progressions (Tentative Title)*	Sharmin Akter



Mahidol University
Faculty of Medicine Ramathibodi Hospital

Evaluation of transitions from early hypertension to hypertensive chronic kidney disease, coronary artery disease, stroke and mortality: a Thai real-world data cohort

Published May 2, 2023

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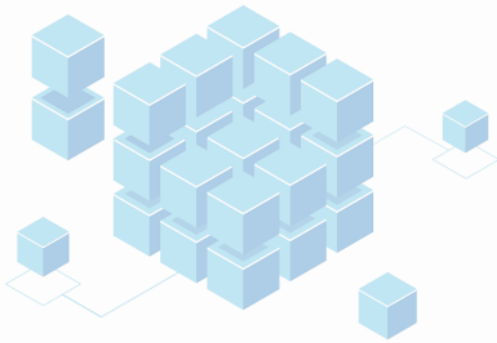


Aim

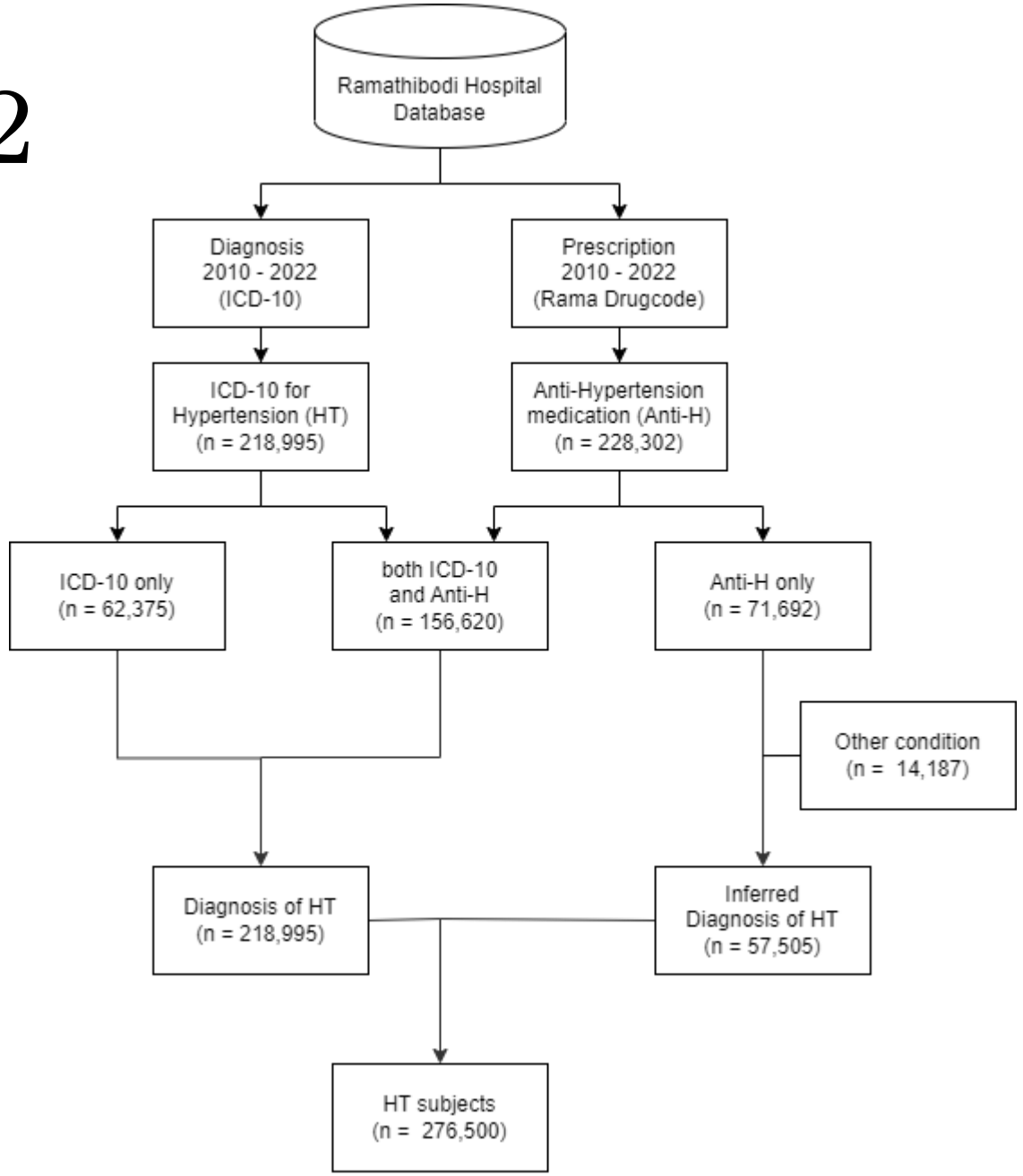
- To construct a real-world cohort profile of HT
- To estimate transition probabilities from the uncomplicated state to any of these long-term complications;
    1. chronic kidney disease (CKD),
    2. coronary artery disease (CAD),
    3. stroke, and
    4. all cause death.

Study data 2010-2022

- Hypertensive (HT) subjects > 18 years old: 276,500

Exclusion criteria

- Complication developed before Hypertension
- Complication developed with Hypertension
- Hypertension developed before study period
- Follow up period less than 30 days



Comorbidity Identification

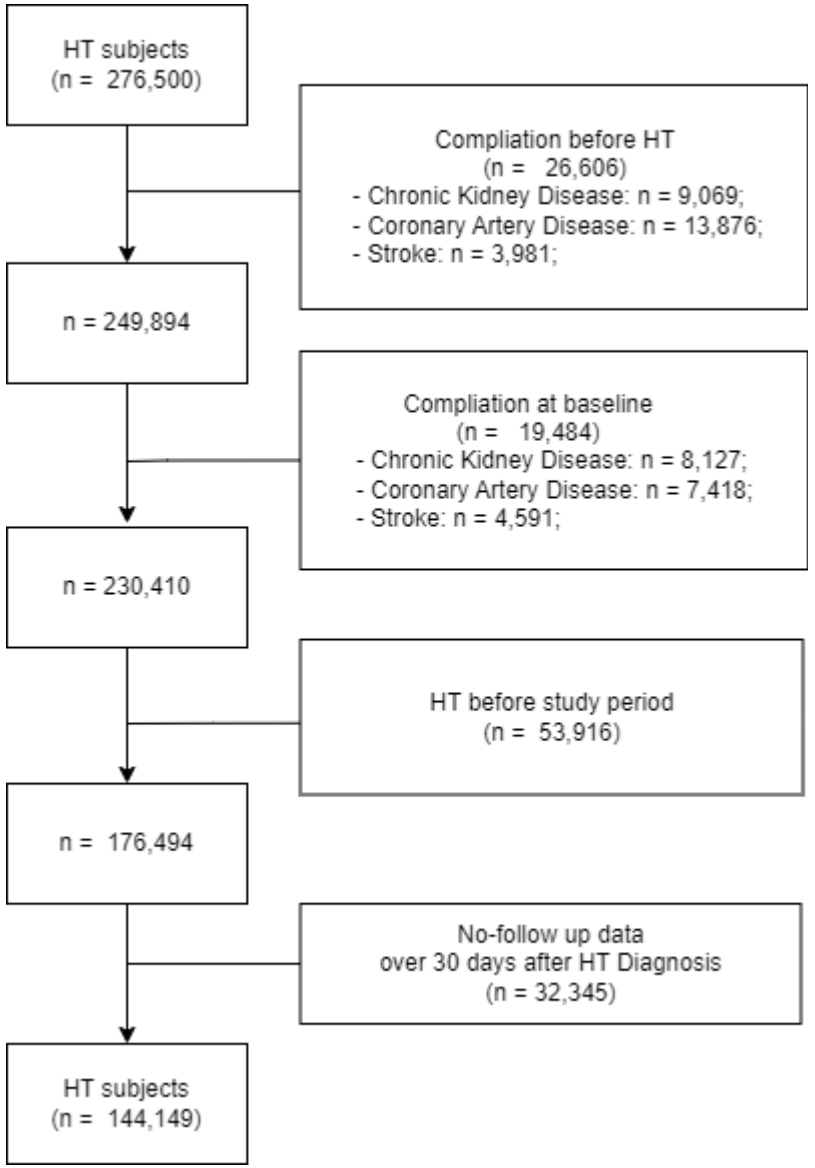
Condition	Criteria
Hypertension (HT)	· International Statistical Classification of Diseases and Related Health Problems (ICD) tenth revision (**ICD-10**) codes for Hypertension [I10, I11, I12, I13, I15] · Use of at least one anti-Hypertensive **medications**
Chronic Kidney Disease (CKD)	· **ICD-10** diagnosis for CKD ['I770', 'N18', 'N19', 'T824', 'T825', 'T827', 'T828', 'T829', 'T85611', 'T85621', 'T85631', 'T85691', 'T8571', 'T861', 'Z49', 'Z490', 'Z4901', 'Z4902', 'Z492', 'Z940', 'Z992'] · **ICD-9** procedures for renal replacement therapy ['38.93', '38.95', '39.27', '39.42', '39.43', '39.53', '39.95', '54.93', '54.98', '55.6'] · **eGFR** measurements less than 60 ml/min/1.73m2 for 2 consecutive tests of more than 90 days interval

Condition	Criteria
Stroke	· **ICD-10** diagnosis for Ischemic strokes ['I63', 'I64'] · **ICD-10** diagnosis for Hemorrhagic strokes ['I60', 'I61', 'I62', 'I69'] · **ICD-10** diagnosis for Transient Ischemic Attack ['G45']
Coronary Artery Disease (CAD)	· **ICD-10** diagnosis for Coronary Artery Disease ['I20', 'I21', 'I22', 'I23', 'I24', 'I25] · **ICD-9** procedures for percutaneous coronary intervention (PCI) or coronary artery bypass surgery (CABG) ['00.4, '00.66', '17.55', '36.0', '36.1', '36.31', '36.99'] · **Troponin** value more than 14 ng/ml with abnormal EKG result 14 days before and after
Death	· Ramathibodi Hospital Death **Registry**

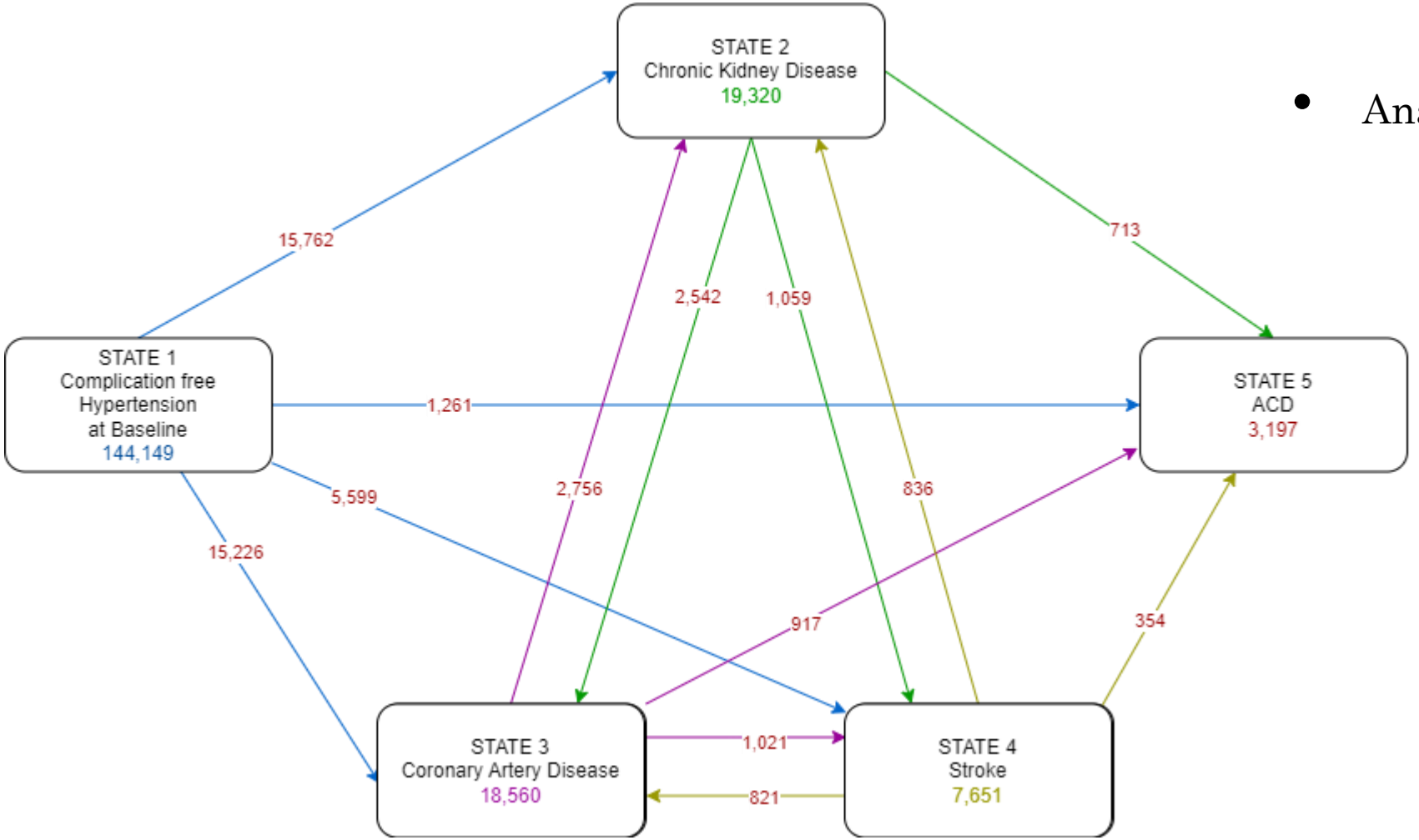
Study data 2010-2022

- Total number of HT: 144,149

- During the 13-years cohort,
  - Total number of CKD developed: 19,320
  - Total number of CAD developed: 18,560
  - Total number of Stroke developed: 7,651
  - Total number of death: 3,197



Materials and Methods



- Analysis using Kaplan Meier test

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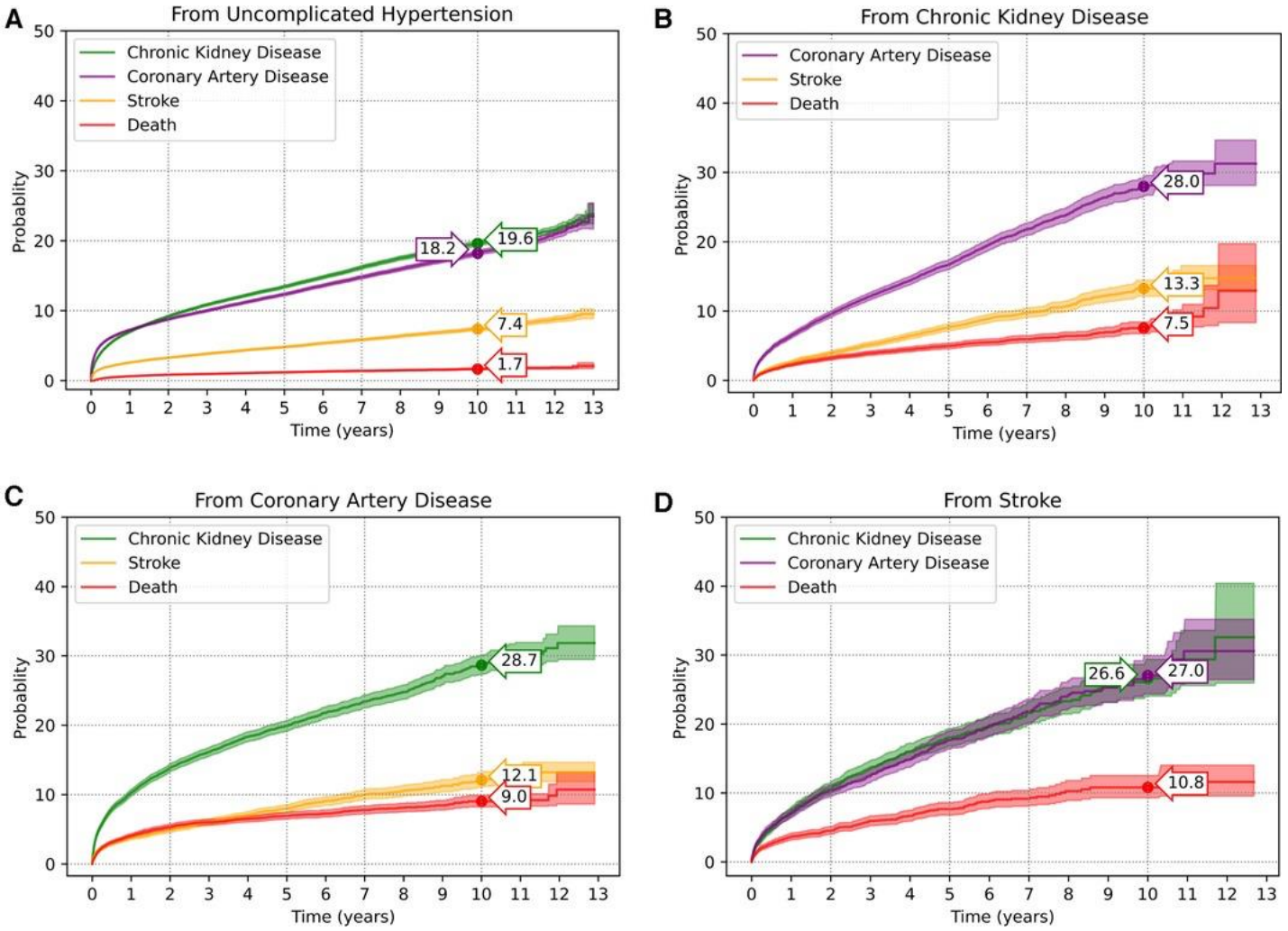
Findings

- CKD — most common in HT, followed by CAD and stroke.
- Stroke — highest risk of ACD, followed by CAD and CKD.
- CKD and CAD — bi-directional relationship.



Findings

- This study applies clinical visit data as real world data for Hypertension

Strengths

- Longitudinal observation of 144,149 hypertensive patients
  - Median follow-up time: 3.6 years *(range: 0.08-13.00)*
  - Median number of visits: 33 visits *(iqr: 11-76)*
- Observation of disease progression from early uncomplicated state to progressive complication states

Limitations

- Lack of data linkage across health providers leads to loss of observations
- Date of diagnosis in Ramathibodi Hospital had to be considered as date of diagnosis of condition

Presentations

The findings has been

1. Published under the title “Evaluation of transitions from early hypertension to hypertensive chronic kidney disease, coronary artery disease, stroke and mortality: a Thai real-world data cohort” in Frontiers in Cardiovascular Medicine, on 2nd of May, 2023.
2. Presented under the title “Hypertension and Its Associated Complications: A Thai Real-World Clinical Cohort” in ISPOR — The Professional Society for Health Economics and Outcomes Research, Boston Convention & Exhibition Center, Boston, Massachusetts, United States, from 7th to 10th of May, 2023.

Further studies

- To assess the factors influencing the disease progression
  - Prognostic factors were not considered in the previous subproject.
  - Findings may aid clinicians and patients delay disease progression, particularly in high-risk patients.
  - Analysis will be done using Cox Proportional hazards model.
- To compare the data preparation approaches for analyses using electronic medical records.
  - Clinical visit data have limitations regarding the date of diagnosis for studied conditions.
  - Different approaches will be proposed and compared.